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ABSTRACT

One of the strongest common assumptions in most Western societies is that education is the key to upward mobility. The few studies to the contrary have been easily dispensed with by reference to flaws in theory or methodology. It is only when an attempt is made to fit some of the key pieces from various areas together (to focus particularly on consistency among a variety of findings) that doubts about the adequacy of this assumption begin to emerge. This paper is an effort to juxtapose pieces of evidence from several areas of the economics of education. The paper argues that there is still substantial doubt about important aspects of our understanding of the role of education in society. Further research needs to be accomplished before the role of education in social and economic change is fully understood. Related documents are ED 057 470 and EA 004 427. (Author/RA)

CONFERENCE ON POLICIES FOR EDUCATIONAL GROWTH

PARIS, 3-5 JUNE 1970

EDUCATION AND DISTRIBUTION OF INCOME

VII

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

FOREWORD

The 1970 Paris Conference on Policies for Educational Growth was organized by OECD as a sequel to its 1961 Washington Conference on Economic Growth and Investment in Education. The purpose of the Conference was to assess the nature and consequences of the expansion of education in OECD countries during the last 10-15 years and to foresee the main policy problems arising from continued educational growth in the future.

The proceedings of the Conference are presented in a set of eight volumes consisting of:

- The General Report of the Conference published under the title: EDUCATIONAL POLICIES FOR THE 1970's,

and the following series of documents containing the twelve supporting studies prepared by the Secretariat:

II - EDUCATIONAL EXPANSION IN OECD COUNTRIES SINCE 1950 - (Background Report No. 1).

III - TRENDS IN EDUCATIONAL EXPENDITURE IN OECD COUNTRIES SINCE 1950 - (Background Report No. 2).

IV - GROUP DISPARITIES IN EDUCATIONAL PARTICIPATION AND ACHIEVEMENT:

Group Disparities in Educational Participation - (Background Report No. 4).

Differences in School Achievement and Occupational Opportunities - Explanatory Factors. A Survey based on European Experience - (Background Report No. 10).

V - TEACHING RESOURCES AND STRUCTURAL CHANGE:

Teaching Staff and the Expansion of Education in Member Countries since 1950 - (Background Report No. 3).

Changes in Secondary and Higher Education - (Background Report No. 6).

Educational Technology: Practical Issues and Implications - (Background Report No. 7).

VI - THE DEVELOPMENT OF EDUCATIONAL PLANNING:

Educational Policies, Plans and Forecasts during the Nineteen-Sixties and Seventies - (Background Report No. 5).

Educational Planning Methods - (Background Report No. 8).

The Role of Analysis in Educational Planning - (Background Report No. 9).

VII - EDUCATION AND DISTRIBUTION OF INCOME - (Background Report No. 11).

VIII - ALTERNATIVE EDUCATIONAL FUTURES IN THE UNITED STATES AND IN EUROPE: METHODS, ISSUES AND POLICY RELEVANCE - (Background Report No. 12).

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EDUCATION AND DISTRIBUTION OF INCOME: SOME EXPLORATORY FORAYS

(Background Report No. 11)

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INTRODUCTION[1]

In the past decade, there has been a very rapid development of the theory which links changes in education to changes in social and economic characteristics of the population. The principal theoretical advances have been in the development of human capital concepts and extensions of production functions and labour supply functions to include human capital. Even more significant, perhaps, is the fact that the theoretical developments have been accompanied by major attempts to test the implications of the theory empirically. In the context of a conference devoted to a review of the growth of education and of expenditures on education, an attempt to review the developments in the theory and the empirical tests of the theory would seem worthwhile. This provided the underlying motivation for the group of papers contributed to this Conference by the members of the Institute for Research on Poverty of the University of Wisconsin. The individual papers do not attempt a comprehensive review of the field; rather each of them is exploring a salient feature of the more general body of theoretical and empirical literature. The papers should be regarded as forays rather than comprehensive studies. In this paper, an effort is made to indicate how these individual forays fit into a more general framework of relationships between education and the distribution of income.

We shall confine ourselves largely to a discussion of economic theories on the relationship of education to socio-economic characteristics; and even where we touch on non-economic theories, the economist's viewpoint is clearly predominant. The empirical studies discussed are for the most part based upon data drawn from the United States, this being largely a matter of our personal experience rather than a judgement on the significance of studies based on data from other countries.

1. In this paper an attempt has been made to draw together the other papers presented to this Conference by the Institute for Research on Poverty of the University of Wisconsin. These papers have been written by F. Golladay, G. Cain and H. Watts, W. Lee Hansen, B. Weisbrod and myself, and they appear as Part II of this volume.

I. BROAD EXPECTATIONS ABOUT THE ROLE OF EDUCATION

It can be argued that the discussions of the past decade about the role of education in the economy would have aroused the following broad expectations on the part of the general public.

a) A reallocation of a country's investment leading to an increase in education will increase the rate of growth of GNP. This expectation might be based upon the view that rates of return on investment in education have been found to be higher than those obtainable on other (private and social) forms of investment.

b) Higher expenditures on education will be associated with less inequality in the distribution of income. The basis for this expectation is the belief that increased expenditure would provide educational opportunities to less privileged socio-economic groups, and that positive rates of return on education are reasonably uniform across socio-economic classes (on the assumption that "innate ability" is not highly correlated with social origins).

c) Increased expenditure on the education of any given group will increase the amount of measured academic achievement of that group. This is, of course, the basic expectation which links expenditures with positive rates of return on investment in education. The economic rewards of a higher academic achievement are reflected in a higher earned income of the individual.

Let us use these broad expectations as a background for reviewing various theoretical and empirical studies which bear on these points. This is simply a convenient way of organising a discussion, and there is no need, therefore, to argue how widespread these broad expectations are, or to set out the necessary qualifications to make them acceptable to research scholars in the field.

Neither this paper, nor the individual papers drawn together here, delve into the literature on the contribution of education to economic growth. A previous OECD conference[1] covers this subject thoroughly, and one need only refer to the subsequent writings of Denison[2], and Jorgenson and Griliches[3] to bring the subject up to date. The discussion in this paper refers only indirectly to the question of the contribution of education to economic growth.

II. RATES OF RETURN ON INVESTMENT IN FORMAL EDUCATION

The basic elements of the human capital theories were quickly put to test in the form of studies of the rates of return on investment in formal education. It might be argued that the ability to demonstrate

1. The Residual Factor and Economic Growth, OECD, Paris, 1964.
2. Denison, Edward F., The Sources of Economic Growth and the Alternatives Before Us, Committee for Economic Development, 1962, and Why Growth Rates Differ, The Brookings Institution, 1967.
3. Griliches, Zvi, and Jorgenson, Dale W., "The Explanation of Productivity Change", Review of Economic Studies, July, 1967.

the empirical relevance of these theories by means of such studies based on cross-section data was an important factor in making these theories acceptable to policy makers as well as to academic circles.

Two of the papers reviewed here are directly devoted to this salient feature. W. L. Hansen draws together the various studies on this subject which have been carried out for many countries, both developed and developing. Hansen's review indicates that, in general, these cross-section estimates of rates of return are sufficiently high to indicate that investment in education yields a return equal to, or greater than, opportunity costs. A large number of cases lend support to the broad expectation that more money spent on education would increase the growth rate of GNP. In comparing the various rate of return studies, Hansen attempts to find some patterns in the rate of return, and explanations for such patterns as appear across countries. These patterns, as well as the paper by R. Hollister which compares some of the data upon which cross-section rate of return studies were based, with time-series information of a similar sort, will be discussed later.

III. THE DISTRIBUTION OF INCOME AND THE DISTRIBUTION OF EDUCATION

As one test of the second broad expectation indicated above - the effect of increased education on the distribution of income - we have drawn together some data on the distribution of income and the distribution of education in various countries.

Anyone familiar with data on the distribution of income is well aware of the great difficulties in dealing with such information. These difficulties are compounded when one attempts to obtain data that are reasonably consistent over time. Furthermore, there is no single measure of the degree of inequality which has gained universal acceptance. In the light of these problems (and because these data have been assembled rapidly) we regard the data and the discussion as preliminary and exploratory.

Table 1 presents such information as we were able to compile on the distribution of income and the distribution of education in various countries. We have used as a measure of inequality the Gini coefficient of income concentration. For education we have used the Gini coefficient formula in a similar manner, applying it to the distribution of the total stock of education in the labour force. Unfortunately, the number of countries for which we were able to get information on both the distribution of education and the distribution of income proved to be limited[1]. Hence, we have included other countries for which we were able to obtain only the income distribution, in order to provide some idea of the variety of experience between countries with respect to changes in the income distribution over recent years.

Commenting only briefly on column one - the index of income inequality - it can be seen that, in general, in the countries included in Table 1, income inequality has been somewhat reduced or has remained constant in the recent past. Only in the case of Finland does there seem to have been a marked increase in income inequality.

Looking next at the index of educational inequality in Table 1, we can see that, in general, inequality in the distribution of education in the labour force has been declining in recent years (note that the Gini coefficient runs from 1, for complete inequality, to 0, for complete equality). This decline in inequality in education has been associated with increasing expenditure per capita on education. The only exception seems to be France, where there was an increase in the index of inequality of 8.2% for males and 5.2% for females in the eight-year period 1954-62.

Comparing the two indexes of inequality, it can be seen that, in every case, education is less unequally distributed than income. Beyond this, the relationship between the distribution of education and

1. We will focus on the relation between these two Gini coefficients and their time trends, and we are not concerned here with the absolute sizes of these coefficients as between countries.

Table 1. GINI COEFFICIENTS OF INCOME INEQUALITY AND EDUCATION INEQUALITY

YEAR	COUNTRY	INDEX OF INCOME INEQUALITY	INDEX OF EDUCATION INEQUALITY
1942/43	Australia	.420	-
1954/55		.360	-
1941	Canada	-	.224
1951		.388	-
1954		.388	-
1957		.388	-
1958		.388	-
1959		.386	-
1961		.383	.209

			MALE	FEMALE
1949	Denmark	.399	-	-
1951		-	.170	.139
1953		.398	-	-
1955		.388	-	-
1961		-	.144	.131
1963		.382	-	-
1952	Finland	.406	-	
1962		.466	-	
1964		.478	-	

			MALE	FEMALE
1954	France	-	.159	.151
1956		.542	-	-
1962		.514	.172	.159

		BEFORE TAX	AFTER TAX	TOTAL PERSONAL INCOME	
1949	Great Britain	.415	.390	-	-
1954		.405	.357	-	-
1957		.362	.322	-	-
1962		-	-	.341	-
1965		-	-	.323	-
1966		-	-	.323	-

Table 1. (continued)
GINI COEFFICIENTS OF INCOME INEQUALITY
AND EDUCAT ON INEQUALITY

YEAR	COUNTRY	INDEX OF INCOME INEQUALITY			INDEX OF EDUCATION INEQUALITY
1946	Netherlands	.495[a]	.487[a]	-	-
1950		.447[a]	.414[a]	-	.179
1952		.436[b]	-	-	-
1960		-	-	-	-
1962		.430[b]	-	-	.167
1950	Norway	.403			-
1957		.384			-
1963		.369			-
1951	Sweden	.542			-
1955		.525			-
1964		.518			-
1966		.530			-
1955	West Germany	.486			-
1960		.467			-
1964		.449			-
1949	United States	.3852			-
1950		.3831			.217
1951		.3681			-
1952		.3726			-
1953		.3648			-
1954		.3803			-
1955		.3752			-
1956		.3635			-
1957		.3588			-
1958		.3598			-
1959		.3646			-
1960		.3719			.190
1961		.3805			-
1962		.3642			-
1963		.3651			-
1964		.3607			-
1965		.3658			-

Notes to Table 1.

Australia

Income : Kuznets, S., "Quantitative Aspects of the Economic Growth of Nations: VIII, Distribution of Income by Size", Economic Development and Cultural Change, January 1963.

Canada

Income : Total Household Income; Distribution of Non-Farm Incomes in Canada, 1951-1961.
Education : Population 10 years of age and older, not attending school, Canadian Census, 1941, 1961.

Denmark

Income : Assessed income after taxes.
Source: Indkomst-og formueansættelserne til staten (annual).
Statistiske efterretninger, 1966.
Statistiske efterretninger, 1959.
Kjeld Bjerke: Income and Wealth, Series X.

Education : Madsen, Pedersen, Elgaard, Nogle Tabeller om Uddannelse, Erhverv og Helbred, 1966. This source gives the educational level of the total population for 1961. The distribution of the labour force has been calculated with the held of data concerning the age and sex distribution of the labour force in 1960. The figures for 1951 have been derived by the cohort method. The distribution over the classes 12, 13-15, 16+ years of schooling has been made from knowledge of the ratio of students finishing secondary school and numbers graduating later from university. The original source had only one class, 12 years and over. The 0.3% without schooling is nominal.
See Denison: Why Growth Rates Differ, Annex F, op. cit.

Finland

Income : Assessed income before taxes.
Source: Statistical Yearbook, IV, Förmögenhetsförhallanden, No. 18-31.
Inkomst-och förmögenhetsstatistik, 1964.

France

Income : Personal income before tax; Etudes et Conjoncture, INSEE, July 1963, December 1965.

Great Britain

ncome : Lydall, H. F., "The Long-Term Trend in the Size Distribution of Income", Journal of the Royal Statistical Society, Series A, Volume 122, Part I, 1959; Ministry of Labour, Family Expenditure Survey, Report for 1962, 1965 and 1966.

Netherlands

Income : a) "Income Distribution in Western Europe", Economic Survey of Europe in 1956, UN ECE.
b) Total personal income before tax.

Education : Source: J. P. Verdoorn, Memorandum, January 1965.
Census data: Denison, Why Growth Rates Differ, Annex F, op. cit.

Norway

Income : Assessed income before tax.
Source: Skattestatistikk inntektsaret (annual).

Sweden

Income : SOS Census 50, Skattetaxeringarna.
SOU 1968: 7, Ägande och inflytande innom det privata näringslivet.

United States

Income : Income of families, from T. Paul Schultz "Secular Trends and Cyclical Behavior of Income Distribution in the U. S. ", Table 1 in L. Soltow (edit) Six Papers on the Size Distribution of Wealth and Income[1].

Education : Persons 14 years of age and over in the experienced civilian labor force, United States, Population Census, 1940, 1950 and 1960.

West Germany

Income : Before tax.
Source: Göseke, Deutsche Institut für Wirtschaftsforschung, Berlin. Göseke in Income and Wealth, Series X.

1. Reder, Melvin W., "A Partial Survey of the Theory of Income Size Distribution" in L. Soltow (edit) Six Papers on the Size Distribution of Wealth and Income, Studies in Income and Wealth, No. 33, National Bureau of Economic Research, 1969.

the distribution of income, as provided by the comparison of the two columns of Table 1, is generally positive, but weakly so. Denmark, which had the largest decrease in the index of education inequality over the ten-year period 1951-61, i.e. 15.3%, had a decrease in income inequality of only 4%. The Netherlands, which had a decrease in educational inequality during 1950-62 of less than half as much, i.e. 6.7%, experienced a decrease in income inequality of 3.8%, almost the same as Denmark. The United States case, over the 1951-60 decade, seems to be similar to that of Denmark, with a sizeable decline in education inequality - 12.4% - but a very limited decline in the index of income inequality - 2.7%. The data on France contradict those of the other countries. For the eight years 1954-62, the index of educational inequality increased, as noted above, but the index of income inequality decreased over the six-year period 1956-62 by 5.2%.

There is some speculation later in this paper on the explanations for this seemingly weak relationship between changes in the distribution of education and income. At this point, it is sufficient to note that other forces affecting the distribution of income have probably not operated, on balance, to widen the distribution. The lack of a strong relationship between educational changes and income changes is, to say the least, disappointing to those who expected it.

IV. SCHOOL ACHIEVEMENT AND SCHOOL CHARACTERISTICS

The basic process which is implicit in the human capital theory developed in the past decade is one in which expenditure on education produces an output in the form of human capital. (There may be other outputs, such as discoveries or inventions, that constitute physical capital, but here we concentrate on the student as the recipient of the investment.) The "technology" of the educational system is expressed as the relationship between such inputs as teachers and school characteristics, and the "educational output" in the form of recipients of education.

Problems arise, of course, in measuring the "educational output" of this system in terms that do not simply count the number of years of school attendance. One approach is to measure the "output" of human capital in value terms, through a calculation of the present value of the money earnings from that asset over the lifetime of the owner. Studies using this type of approach are reviewed in the paper by Hansen. Another approach to measuring "educational output" relies on test scores of school achievement - an approach rather analogous to measuring output in terms of physical units, such as horsepower.

As noted under I, one would expect to find a roughly positive relationship between school characteristics (as inputs) and the two types of measure of "educational output". Most rate of return studies, however, have been based on data from cross-section population surveys which did not include characteristics of the schools in which the individuals were trained. It has, therefore, been necessary to utilise the second measure of "educational output", test scores, in order to relate school characteristics to an output measure.

In his paper to this Conference, F. Golladay discusses the problems which arise when one attempts to explore the relationships between school characteristics and school achievement. He makes it very clear that the translation of educational theories into quantifiable relationships is extremely difficult. The main problems appear to lie in finding, or measuring accurately, many of the theoretical variables, particularly in terms of the time sequence in which they enter the model. The results are models that appear, with hindsight, to be too crudely specified to isolate adequately the relationships between school characteristics and school achievement. So far, the sutdies have been based on models of rather simple relationships between characteristics and achievement[1].

1. See Appendix for brief review of three major studies.

These rather simple models have, however, been the basis for most large-scale studies of the educational system. We would argue that these studies do reasonably reflect beliefs of policy makers about the characteristics of schools which affect achievement; policy makers formulate and discuss educational policy as though the variables selected in these studies were those which determine "educational output". To this extent, these studies do constitute a test of assumptions upon which most policy makers have operated; if the relationships tested are misleadingly simple, then the policies which they reflect have also been too simplistic.

It may be said - though admittedly we generalise rather broadly here - that these studies show that, when non-school variables have been controlled for, virtually no relationship can be found between achievement and those school characteristics which have traditionally been thought to be significant, e.g. expenditures, pupil-teacher ratios, classroom size. This is a basic and extremely important result: there is to date no empirical justification for the expectation that school achievement of a given group can be increased by increasing expenditure per student per year. Furthermore, there is no clear indication as to which are the school characteristics policy makers might manipulate in order to increase school achievement. The most that can be said is that more conclusive results might be found if we had better specified theories, stronger data and better statistical techniques. Golladay offers some constructive suggestions for such improvements in testing models of educational achievement. For the time being, however, policy makers have no more than intuition to guide their decisions, and the failure of past attempts to verify the assumptions about schools and the educational process - assumptions which seem to have guided their decisions - suggests that these assumptions should be treated with some scepticism.

V. SUMMARY OF THE EVIDENCE IN RELATION TO THE EXPECTATIONS

Before passing to a further exploration of possible explanations of the data, we can summarise this extremely cursory review of the evidence with regard to the broad expectations outlined under I.

Rates of return on investments in education have generally been found to be positive and greater than, or equal to, opportunity costs. This would seem to lend support to the expectations with respect to the effect of education on growth rates.

For most countries, there is evidence of a decrease of the inequality in the distribution of education in the labour force. This decrease, combined with the positive rate of return on education, led to the expectation of a lesser inequality in the distribution of income. The evidence on this point is not conclusive. While declines in inequality of education were in general associated with declines in income inequality, the relationship varied considerably as between countries and, in one case, declines in income inequality were achieved even when educational inequality was increasing. Thus, the empirical evidence is far from conclusive as to the effects of increased educational expenditures on the distribution of income.

It is with respect to the third broad expectation - that increased expenditure on the education of any given group will increase the amount of measured school achievement of that group - that the evidence available is most disturbing. Even more disturbing is the fact that a significant relationship between expenditures and school achievement is, as noted under I, an expectation which would seem to be basic to the other two. The discussions by Golladay, and Cain and Watts of the problems of measuring relationships between school characteristics and school achievement should certainly make one cautious about interpreting the studies carried out on this subject. The failure of even the simple studies thus

far carried out to find such relationships is a fact which must give rise to scepticism with regard to conclusions based upon studies on the rate of return.

Our review of the empirical evidence leaves us with major unresolved questions about the role of education with regard to the level and distribution of income. In the following pages we shall consider a number of alternative explanations of these apparant conflicts of evidence and point to further empirical evidence bearing on these problems.

VI. ALTERNATIVE EXPLANATIONS OF THE RELATIONSHIPS BETWEEN SCHOOL CHARACTERISTICS AND SCHOOL ACHIEVEMENT

1. Golladay indicates a large number of possible weaknesses which could explain the negative findings regarding school characteristics and school achievement, e.g. inadequate measures of inputs or outputs, inappropriate translation of educational theory, misspecification of functional forms of input-output relations, inappropriate statistical procedures. One statistical problem which leads to the proposition that schools have not been fairly "tried" deserves special mention. In the paper by Cain and Watts, it is pointed out that the statistical techniques used in the Coleman Report did not effectively discriminate between those cases in which the lack of statistical significance of school characteristics variables is due to the lack of variability independent of non-school variables, i.e. collinearity between school characteristics and non-school variables, and those cases in which there is a lack of statistical significance because the best estimate of the relationship (the regression coefficient) is extremely close to zero. In other terms, if both the socio-economic background of students and higher expenditure influence school achievement, but all the high expenditure schools are in districts in which students come from a high socio-economic milieu, it may be impossible to separate the effects of the school from those of background. In this sense, schools might be said not to have been "tried", since their power effectively to offset negative influences of background has not been truly tested.

2. It might be that, within the range of educational system development covered by these studies, schools work only as "ageing vats". Since the studies on the rate of return indicate that individuals with more years of education have larger incomes, while the studies on school characteristics indicate that additional expenditure does not increase school achievement, it may be that the gains in socio-economic productivity provided by education can only be attained by keeping individuals in the system for more years - thus the term "ageing vat". One formulation of this idea is that increased expenditures on schooling yield increases in productivity if used for giving more years of education to a group of individuals, but do not yield increased productivity if used to give more "intensive" doses, i.e. more resources per student per year. This would be one way of reconciling the rate of return results with the school characteristics achievement results. If this idea were correct, it would have important implications for educational policy. It is not hard to believe that there is some optimum rate of absorption by students of educational inputs, and thus a level at which increases in "intensity" of education would fail to yield positive returns. However, it is hard to believe that where levels of educational investment are so high, even in the United States, the educational system has reached a point of zero return on "intensification" of education through addition of inputs per year, though this would be consistent with the evidence available.

3. It has often been suggested that the educational system is really only a social device for "screening and labelling" individuals according to their social background. This explanation is similar to that raised in point 1. above, with one important difference. It was suggested that schools might influence achievement more if school characteristics were rearranged so as to offset social class differences. Here we suggest that such rearrangement of characteristics might have no effect: either the "best schools" would continue to be identified according to the high socio-economic background of their students (independent of the school characteristics), or some other social device would take over the screening and labelling function of schools.

This screening and labelling function is sometimes referred to as "sheepskin effect", the idea being that the more possession of a degree will be taken by employers as proof of productivity (see, for example, Hansen, Weisbrod and Scanlon[1] for an investigation of this issue).

An impressive and depressing paper by R. Weiss[2] would seem to lend some support to this screening and labelling hypothesis. In a carefully designed study based on United States 1960 census data, Weiss found that, for non-whites, there was no significant relationship between additional years of education and earned income. It might be argued that, in the case of non-whites, a stronger screening and labelling device displaces the use of the educational system for such a function. The social class of non-whites being identified in the employers' minds by their race, identification by educational degree is ignored. There are, of course, simpler explanations for Weiss's results. To consider only measurement problems: there is the likelihood that conventional measures of educational resources for non-whites, whether in terms of years, test scores or expenditures, are in reality poor substitutes for measures of the quality and quantity of the resources that do reach and educate non-white children in those skills that they are interested in learning in order to make a living in a society marked by severe racial discrimination. This source of errors in measurement is compounded by more customary types of reporting errors, which are also probably more serious for non-whites. Both types of errors could cause a "no effect" verdict for education. Another explanation is that, although education does increase the productivity of non-whites, employer and/or market discrimation against non-whites (particularly males) increases as the education of non-whites increases. However, in seeking alternative explanations of the empirical findings reviewed here, we should not ignore the possibility that Weiss's findings lend support to the screening and labelling hypothesis about education.

This screening and labelling argument could provide a consistent set of explanations for the findings on school characteristics school achievement and on the rate of return. If schools do not really function in the sense of creating greater economic productivity beyond that determined by the social background of the individual, but if more years of school, or more schooling per year, tends to be correlated with higher socio-economic background, then schools would act as a screening and labelling device to indicate higher socio-economic background, which employers seek. Thus, even though schools as such do not increase productivity, people with more years of school or attendance at "better" schools would receive higher incomes, and this would give the results reflected in the positive findings in terms of rates of return. To the question of why the children from high socio-economic status go to school at all, or at least go to school longer, one answer would be: for consumption benefits. Of course, authors of studies on the rate of return have attempted to take this kind of factor into account by making allowances for "ability" (see, e. g. Griliches[3]), but it is widely agreed that these ability adjustments are inadequate as controls for innate ability. Further, "ability" may be less responsible for the favoured position of the children from higher socio-economic groups than the acquisition of "social graces", or "connections".

In concluding this section, let it be emphasized that our purpose has been to propound several possible alternative explanations of the evidence reviewed. Perhaps the best explanation is, as Golladay suggests, that the results of the large-scale studies, such as those reviewed in the Appendix, were primarily the outcome of serious flaws in the design of the studies. However, we have no large scale empirical studies which would provide contrary results, and we have thus no grounds for rejecting any of the possible hypotheses outlined here. Researchers and policy makers need to keep clearly in mind that the empirical evidence to date does not support the traditional concepts of the relationships between school characteristics and achievement; the fact that this area raises so many major questions must cast a

1. Hansen, W. L., Weisbrod, B.A., and Scanlon, W.J., "Does Schooling Really Count?", American Economic Review, March 1970.

2. Weiss, Randall, "The Effect of Education on the Earnings of Blacks and Whites" Discussion Paper 14, Program of Regional and Urban Economics, Harvard University, April 1969.

3. Griliches, Zvi, "Notes on The Role of Education in Production Functions and Growth Account", Paper for NBER, Conference on Research on Income and Wealth, Madison, Wisconsin, November 1968.

shadow across the traditional interpretations of the other relationships between education and the level and distribution of income (e.g. the meaning of the rate of return findings, and assumptions about the role of education in economic growth).

VII. ALTERNATIVE EXPLANATIONS OF RELATIONSHIPS BETWEEN EDUCATION AND INCOME

One explanation of the seeming inconsistency between our initial expectations with regard to the relationship between education and income distribution is simply that our initial expectations were far too simple. We proceed, therefore, to consider several potential factors which could imply more complicated relationships between education and income distribution.

1. Calculation of rates of return on investment in education have been based upon estimates of lifetime income using mean (or median) incomes for each age-education group. For each such group there is, of course, some variance around that mean and, in drawing inferences about the effects of changes in education on the distribution of incomes, we need to take account of the variance of income within, as well as between, education groups. The Gini coefficient of income can be thought of, in relation to education groups, as a weighted sum of the Gini coefficient of income within education groups and the Gini coefficient of income between education groups. Even if the Gini coefficients between and within groups remained constant, the changing distribution of years of education would give different weights to the groups. Thus, even if the distribution of years of education became less unequal, the relative weights of groups with greater group Gini coefficients could be increasing, and thereby yielding increases in the overall coefficient of income. We will not pursue this matter in detail here. Table 2 for the United States in 1956, drawn from Soltow[1], may be sufficient to illustrate the point.

Table 2. COEFFICIENTS OF CONCENTRATION OF INCOME OF FAMILIES AND UNRELATED INDIVIDUALS 25 YEARS AND OVER, ANALYSED BY EDUCATIONAL LEVEL IN 1956

	UNDER 8 YEARS	8 YEARS	9-11 YEARS	12 YEARS	13-15 YEARS	16 OR MORE YEARS
Within group Gini	.453	.409	.341	.328	.372	.393
Between group Gini	.479	.409	.382	.373	.400	.436

SOURCE: L. Soltow, op. cit.

It can be seen that, as the reduction in weight of the 8 and 9-11 groups is more than offset by the gains in weight of the 13-15 and 16-and-over groups (group Gini coefficients remaining constant), the overall Gini coefficient could increase.

1. Soltow, Lee, "The Distribution of Income Related to Changes in the Distribution of Education, Age, and Occupation", Review of Economics and Statistics, November 1960.

The potential for such an effect, due to changes in years of education, was checked for the United States by Soltow, using projections of years of education up to 1980 and the group Gini coefficients reported in the table. He found that, up to 1980, the changes in education projected for the United States would still be such as to work toward reducing the Gini coefficient of income; the growth in the weight of the 12-year group (which has the lowest Ginis) would still be the predominant effect, at least until 1980.

This should not be taken as a completely adequate check of the r ayed by group mean group variance relationships in complicating the simple education-income . bution first hypothesised. We have indicated only the nature of the possible complicating factor an rough indication of the likely direction of such effects for the United States.

2. It could well be that our initial expectations that changes in the distribution of education would have clearly identifiable effects on the distribution of income were correct, but that these effects have been offset by other factors working in the opposite direction. (This might be conceptualised with regard to point 1. above in terms of factors causing shifts in the within-education group Gini which offset the effects of shifting weights of the various groups.) Changes in education could be offset by changes in the structure of industry, or the age or racial composition of the population, etc.

A simple empirical check for such effects can be made for the United States in the 1950-1960 period. Conlisk[1] has constructed a model which attempts to explain differences in the Gini coefficient of various States in the United States in 1960. He used a number of independent variables to explain the State differences, entering these variables as both first and second order terms. The results of his analysis are reported in Table 3.

Table 3. CROSS-STATE INCOME INEQUALITY REGRESSION[1]

EXPLANATORY VARIABLES	REGRESSION COEFFICIENTS, AND ESTIMATED STANDARD DEVIATIONS OF REGRESSION COEFFICIENTS (IN PARENTHESES)		CONTRIBUTION OF VARIABLE TO VALUE OF DEPENDENT VARIABLE, CALCULATED AT SAMPLE MEANS
	LINEAR TERM	SQUARED TERM	
Educational Inequality	1.092 (.474)	- 1.909 (1.053)	.142
Property's Share	...	.498 (.166)	.012
Fraction Non-White	.124 (.047)	- .153 (.066)	.010
Fraction Old or Young	1.843 (.411)	- 2.169 (.619)	.391
Fraction Unemployed	- .622 (.352)	6.413 (2.578)	- .013
Fraction (Non-Farm) Rural	...	- .090 (.039)	- .008
Median Income	- .000 0192 (.000 0039)	...	- .086

1. Sample size = 51; R^2 = .91; the regression is forced through the origin.
SOURCE: J. Conlisk, op. cit.

1. Conlisk, John, "Some Cross-state Evidence on Income Inequality", Review of Economics and Statistics, February 1967.

Using the coefficients from Conlisk's cross-section, State-to-State model, we entered the change in the same variables for the United States as a whole from 1950 to 1960. This gave us a means of allowing for simultaneous changes in education and non-education variables which were expected to affect the Gini coefficient of income. The results of this exercise are reported in Table 4.

It is noteworthy, first of all, that the model coefficients lead to a prediction of a substantial decrease in the Gini coefficient of income for the United States from 1950-1960. This does not accord with the actual experience for that period given in Table 1 above. Second, of the total predicted change, over half was due to the predicted effect of change in the Gini coefficient of education. Third, all of the non-education factors except one (fraction non-white) had predicted effects in the same direction as education, i.e. decreasing the Gini coefficient of income (and the offsetting effect of fraction non-white was very small).

Table 4. PREDICTED CHANGE IN GINI COEFFICIENT FOR INCOME 1950-1960 USING CONLISK'S CROSS-SECTION MODEL COEFFICIENTS

	VALUES FOR THE UNITED STATES AS A WHOLE		1950 - 1960 CHANGE IN INCOME GINI[1]
	1950	1960	
Educational Inequality	.883	.810	- .06890
Property's Share	20.37	14.50	- .00170
Fraction Non-White	10.68	11.42	+ .00091
Fraction Old or Young	40.24	39.24	- .01821
Fraction Unemployed	5.3	5.6	- .00181
Fraction (Non-Farm) Rural .	20.69	22.63	- .00003
Median Income	3.025	5.009	- .03809
Total change in Income Gini for United States 1950-1960			- .12965

1. These values are obtained by taking the difference in the values from 1950 to 1960 and multiplying them by the appropriate coefficient from Table 3.

Admittedly, the use of the Conlisk model as a means of controlling for effects of non-education factors is based on the assumption that the structure determining State-to-State differences in income inequality is similar to that which affects changes in United States inequality over time; but it is usually the intent of such cross-section models to shed light on the time-series structure. Conlisk himself points to some anomalous features of his cross-State results, and the fact that the time-series change it predicts is so much at variance with the actual 1950-1960 results would seem to indicate that the assumption is not valid. Still, this exercise does represent at least a crude attempt to allow for the influence of non-education variables and, at the very least, it would seem to indicate that there is no strong presumption that the relation between education inequality and income inequality has been seriously masked by offsetting non-educational effects. (It suggests, of course, that the reasons for the conflict between the time-series and cross-section results deserve further investigation.)

3. In our statement of initial expectations, it was assumed that less inequality of educational opportunity would imply less inequality in the distribution of income. Meade[1] and Reder[2] have pointed out that this is by no means certain. The outcome would depend on the relative importance of talent and training. As Reder observes: "The marginal return imputable to native talent, relative to that imputable to training, will surely vary as investment in training becomes greater and more widespread. As appropriately trained persons become more abundant, jobs which have paid well heretofore because of the great training required, but which require little native talent, will decline in earning power relative to those requiring greater degrees of talent." In simpler terms, Meade and Reder refer to the replacement of an "aristocracy" by a "meritocracy", the net effect of the income distribution being unclear.

4. Meade states "... in the past the spread of public elementary education in the developed countries has almost certainly been an important equalizing factor. It has in essence been an investment with a high return, financed out of general taxation for the benefit of every citizen. ...". He goes on to point out that publicly supported higher education may have just the opposite effect. The Conference paper by B. Weisbrod and W. L. Hansen shows that this possibility is in fact the case in the United States. What is most striking about their findings is that Meade's speculation holds for what had generally been supposed to be the most egalitarian system of public higher education in the world, that of the State of California. Thus, there is the distinct possibility that whereas public education at the early stages was an equalizing force on the income distribution, at later stages of development, with extensive public higher education, it becomes just the reverse, costs of education being broadly shared by the taxpayers but benefits being captured primarily by the higher income groups.

These findings by Hansen and Weisbrod suggest that the index of educational inequality utilised above, and based solely on years of education, may be misleading. It might be more relevant to utilise an index based upon the distribution of education resources. Clearly, years of higher education cost more and, thus, though years of education are becoming less unequally distributed across the population, educational resources may well have become more unequally distributed. In order to check on this possibility, we have calculated Gini coefficients for education in which education level attained is weighted by the costs of that education. The resulting Gini coefficients are shown in Table 5.

Table 5. INDEX OF INEQUALITY IN THE DISTRIBUTION OF EDUCATIONAL RESOURCES IN THE LABOUR FORCE IN THE UNITED STATES

YEAR	GINI COEFFICIENT OF THE DISTRIBUTION OF EDUCATIONAL RESOURCES[1]
1950	789
1960	806

1. Years of education in the United States labour force (from sources indicated in Table 1) were weighted by the 1949 costs of education (both direct and foregone earnings) drawn from Tables 1 and 2 of W. L. Hansen "Total and Private Rates of Return to Investment in Schooling", Journal of Political Economy, 1963.

1. Meade, James E., Efficiency, Equality and the Ownership of Property, Allen and Unwin 1964, pp. 59 and 61.
2. Reder, Melvin W., op. cit., p. 226.

Whereas the data in Table 1 indicated a decline in the inequality of the distribution of years of education in the labour force, the data in Table 5 indicate that, when account is taken of the differences in educational costs, the inequality in the distribution of educational resources in the labour force seems to have increased between 1950 and 1960 in the United States. (Note that the costs weights used are estimates of the costs as of a given year, 1949. It is not clear whether using historical costs relevant to each age cohort would decrease or further increase the measures of inequality in the two years.)

5. It could well be that the results of the rate of return studies based on cross-section income data are misleading with respect to rates of return actually experienced over time.

a) In the Conference paper by R. Hollister, this possibility is investigated, and it was found that income streams of cohorts actually observed during periods of 20 years and 10 years differed significantly in present value from what would have been expected on the basis of the base year cross-section information (taking general economic growth into account). A crude translation of these differences in present value of income streams into internal rate of return terms indicated actual cohort rates which were -7 to + 3 percentage points different from expected rates for the twenty-year period (and -3.6 to +4.5 percentage points different for the ten-year period). There was, however, no clear pattern in these differences either between levels of education or across cohorts.

b) The findings of differences between actual and expected cohort income streams indicates the obvious need to look more deeply into the multiplicity of factors which impinge differentially on the income streams of various cohort education groups.

At the most general level, we can classify the factors which affect cohort income streams into three broad classes:

i) demand factors - due to changes over the long term in derived demand for educated labour as a result of shifts in the composition of final demand accompanying growing per capita income, and due to changes in technology (see Reder[1] for a much richer list of potential demand-related factors);

ii) supply factors - changes in the supply of labour with a given level of education relative to other types of labour and relative to capital and material input supplies;

iii) cyclical effects - due to fluctuations in the level of economic activity.

c) We have only threads of evidence on the role of even these broad factors. Taking them in reverse order, we note the following:

i) It is shown in the paper by Hollister that the general shape of the cross-section profiles is affected by the level of unemployment. Thus, selecting any single-year cross-section as a basis of prediction of income streams may be misleading. The estimated effects of the level of economic activity (as indicated by the unemployment rate) differ according to age and level of education.

ii) The attempts in the Hollister paper to find relative supply effects were not very satisfactory. The relative supply variables had the theoretically incorrect sign over a considerable part of the age range. This casts some doubts on the reliability of the crude multifactor model used, and indicates the need for more refined analyses of supply effects. In his Conference paper, Hansen also sought to find relationships between the inter-country differences in relative supply. These attempts also failed to yield any indication of supply effects.

1. Reder, Melvin W., op. cit.

iii) Demand effects are measured in the Hollister paper solely by the coefficient of time trend variables. This is certainly inadequate. However, the results do indicate that the time shifts affect various age-education segments of the labour force differentially. Whether this is called - as some similar but more obscure measures in the past have been - the effects of "economic growth", or "technological change", or simply residual time-series effects, it is clear that such effects make attempts to predict income streams solely from a selected year's cross-section data untenable.

iv) The fact that effects on income streams related to these factors (however crudely measured) were significant and sizeable, indicates that more complicated models of the determination of the education-income relationship are called for. It should be noted that the investigation of these broad effects does not deal explicitly with the plausibility of the other hypotheses which have been outlined as possible explanations of the configuration of data. It does suggest that expectations of finding simple relationships between education and the distribution of income which are stable over time are likely to be disappointing, since even these few factors seem to generate complicated and significant effects on the education-income relationships.

VIII. SOME CONCLUDING REMARKS

One of the strongest common assumptions in most Western societies is that education is the key to upward mobility. This common belief in the efficacy of education as a means for individual social advancement has been combined, over the past several decades, with a growing social consensus that education should be used broadly as an instrument for social change, i.e. a large-scale opening of educational opportunities through governmental intervention should be a principal, or even perhaps the principal, instrument for the transformation and progressive modernization of societies.

One might conjecture that the numerous applications of economic theory to the assessment of education and its role in economic and social processes have been unusually well received because they seem to lend social scientific support to these widely-held beliefs; they seem to legitimize our faith in education.

The sheer volume of scholarly literature devoted to the economics of education in itself testifies to the substantial advances which have been made in the past decade in the development of the relevant theory. Practitioners in this field have also moved with unusual rapidity in seeking to test empirically the implications of the newly developed theories. Thus, within a relatively short period of time, the common faith in the role of education has been bolstered by an elegant framework of economic theory and reinforced by substantial quantitative evidence. Furthermore, the economic analysis seems to indicate that investment in education will not only improve the lot of the individual by enhancing his economic and social position but it will also contribute to the society's overall goal of economic growth; much as Adam Smith had demonstrated that pursuit of individual selfish ends resulted in greater good for society, so the education economist seems to show that individual and social advancement are wholly complementary.

This is the picture one might draw, at least superficially, from an overview of the developments in this field in the past decade. Looking at policy documents in recent years, one might conclude that the relationships between education and economic and social processes are now well understood. In fact the economic imperative has recently been a primary motif in arguments for increases in educational expenditures.

If one reviews the major pieces of work in each area of the economics and sociology of education, this happy picture seems quite reasonable. The few individual clouds on the horizon (e.g. the school characteristics and school achievement studies) have been rather easily dispersed by reference to flaws

in theory or in statistical techniques. It is really only when an attempt is made to fit some of the key pieces from various areas together - to focus particularly on consistency among a variety of findings - that doubts about the adequacy of understanding of relationships begin to emerge.

This paper, combined with the five background documents on which it is based, submitted to the Conference, constitutes just such an attempt to juxtapose pieces of evidence from several areas of the economics of education. It is not comprehensive and, perhaps, in the selection of points considered important, it is misrepresentative. However, it is shown in these papers that the juxtaposition of empirical evidence does raise a number of substantial, unresolved issues. (It might be added that reference has not even been made here to the mounting evidence on the failure of attempts at compensatory education in the United States; see, for example, Ribich[1]. This evidence would further deepen the shadow of doubt cast over the happy picture, sketched above, of our understanding of the role of education in society.)

To the extent that this paper has been biased in seeking out the seeming paradoxes at the expense of less equivocal findings, it may perhaps be excused as a necessary antidote to the head-long rush of the past decade to boost education to the highest position as a force for economic and social development. Where the tide of common belief runs so strong, it would seem wise for the social scientist to take extraordinary care to perceive any indications of counter-currents in his evidence.

It is particularly important for the social scientist to be cautious about easy legitimization of the common belief when, as in the case of education, the social consensus has focused on it as the major force which works, and is to be used purposefully, for social change. Because there is such a consensus, any pressure for social and economic change is easily funnelled into this channel, education. What if, however, the efficacy of education as an instrument for change is not as clear as the common belief would suggest? If that is so, then the pressure for change is being diverted into futile educational activity; activity which will not, in fact, generate change, and the social scientist is aiding in this diversion. It is much the easiest thing for the social scientist to bend to the common belief, but in doing so he may be supporting a process in which the energy to attempt more difficult, less agreed-upon, but possibly more effective, means of social change is sapped.

It should not be concluded from this that results obtained in the economics of education in the past decade have been incorrect. All that has been argued is that there is substantial doubt about important aspects of our understanding about the role of education in society: there are hypotheses which cannot be rejected by the evidence at hand which, if correct, would profoundly disturb our beliefs about education. This does not mean research on education is fruitless. On the contrary, the research agenda is quite full (papers for this Conference supply the specifics of many items on that agenda) and, for the reasons suggested above, the urgency for dealing with that agenda is greater than ever. We need to move rapidly, either to dispel thoroughly the doubts raised in this paper about the efficacy of education as a force for social and economic change, or, if the doubts are substantiated, to deepen our understanding of educational processes to the point where we can transform education into a truly effective instrument of social and economic progress.

1. Ribich, Thomas I., Education and Poverty, Brookings Institution, 1968.

Appendix

A BRIEF REVIEW OF SOME RESEARCH STUDIES OF EMPIRICAL RELATIONSHIPS BETWEEN SCHOOL CHARACTERISTICS AND SCHOOL ACHIEVEMENT

(Adapted from an earlier draft by F. Golladay)[1]

Three major large-scale studies of the empirical relationships between school characteristics and school achievement are described and commented on in this Appendix. This is not meant to represent a comprehensive review of these works, rather a few key features have been selected for description and commentary.

1. EQUALITY OF EDUCATIONAL OPPORTUNITY: THE COLEMAN REPORT

The most influential and widely cited study of the influence of school characteristics upon education achievements is Equality of Educational Opportunity by James S. Coleman, Ernest Q. Campbell, et al. More commonly referred to as the Coleman Report, the document describes an attempt to study the effects of school inputs through a multivariate statistical analysis of more than 645,000 students and 3,155 schools. The project was conducted at the direction of the United States Congress with the principal purpose of determining whether the quality of education provided by American schools is systematically related to the race, religion, national origin, or ethnic affiliation of the student.

The data base for the study was obtained from a special survey conducted by the United States Office of Education. The sample was drawn by stratified, probability sampling techniques in order to assure that minority racial and ethnic groups would be over-represented. The original sample contained approximately 900,000 students in 3,155 sample schools. A cross-sectional sample was obtained for enrolments in grades 1, 3, 6, 9, and 12. Of the 1,170 high schools in the initial sample, 61% were eventually excluded, either because of faulty responses or refusals to cooperate, or were systematically associated with what might be expected to be inferior educational situations. In particular, large, northern, central cities were reluctant to respond, and schools where questions such as race and the quality of the teaching staff might be regarded as sensitive, supplied only partial replies. The non-response problem, while serious for purposes of description of American education, is relatively unimportant in a study of the underlying technology of education so long as the sample contains the full range of practices that may be observed.

The survey obtained information from individual students regarding ability, achievement, family background, and attitudes; teachers, principals, and district superintendents were asked questions about the quality and quantity of inputs and their attitudes toward the school and its students. The statistical analysis employed verbal ability, as measured by the Educational Testing Service School

1. Additional studies and their results are presented in Background Report No. 10 (Vol. IV) "Differences in School Achievement and Occupational Opportunities: Explanatory Factors. A Survey based on European Experience".

and College Ability Test, as the dependent variable. The family background of students was measured by a set of nominal variables including urbanism of background, parents' education, structural integrity of the home, size of family, parents' interests, the student's perception of parents' aspirations for his education, and the family ownership of the following items: television set, telephone, record player, refrigerator, automobile, vacuum cleaner, dictionary, encyclopedia, daily newspaper, magazines, and books. This information was gathered from the students and their teachers, not by direct household survey. The students' attitudes were measured by a very brief and crude attitude inventory which attempted to measure interest in school, self-concept, and sense of control of the environment. The reliability of student responses and the survey instrument were not evaluated. The characteristics of the student body were obtained from both the student and school questionnaires; the social context of education was measured by the proportion of students from homes with encyclopedias, the proportion definitely planning to attend college; the per cent attendance rates and the average hours of homework per student.

School inputs were measured with eighteen variables. School facilities and curriculum were represented by per-pupil expenditure on staff, volumes per student in the school library, the existence of science laboratories, number of extra-curricular activities, presence of accelerated curricula, comprehensiveness of the curriculum, strictness in promotion of slow learners, use of ability grouping or tracking, movement between tracks, school size, number of guidance counsellors, and urbanism of school location. The staff inputs into the school were measured by school-wide averages of the following variables and indices: educational attainment of the teacher's mother, years of teaching experience, localism of teacher in the school, educational attainment of the teacher, score of the teacher on a self-administered vocabulary test, teacher's preference for teaching middle-class, white-collar children, and proportion of white teachers in the school. Measures of school inputs were obtained from teachers, principals, and superintendents; missing data were estimated from the remainder of the sample. All of the variables are simple arithmetic averages for the entire school, hence the large number of degrees of freedom suggested by the size of the sample is in some cases misleading. The true sample size for analysis relating to school characteristic variables is the number of cooperating schools.

The statistical analysis implicitly assumes that educational achievement as measured by verbal aptitude is a simple linear function of the variables considered above. The authors argue that socio-economic variables are logically prior to the educational process, and hence control statistically for these variables prior to examining school characteristic variables. The analysis thus employs stepwise linear regression, but, rather than reporting the regression coefficients, the report only indicates the contribution of each variable to the explanation of the dependent variable. Thus, the study, in effect, uses the technique of analysis of variance. Problems which arise with the use of this statistical technique are discussed in the Conference paper by G. Cain and H. Watts.

On the basis of the statistical analysis, it is concluded that schools bring little influence to bear upon a child's achievement level, but rather that socio-economic characteristics of the family and community determine almost all of the statistically explainable variation in school achievement measures. Further analysis of the results indicates that the relationship of family background to achievement does not diminish over years of schooling. Characteristics of teachers are found to be the most important school influences, but even these variables account for very little variation. The social composition of the student body is found to possess more explanatory power than any school input or characteristic. Student attitudes are highly correlated with achievement but appear to be very insensitive to school characteristics. Weakness of the theoretical model implicit in the analysis, and resultant difficulties of interpreting many of the variables discussed above, are also examined in the paper by Cain and Watts; and a number of the problems in finding appropriate variables are discussed in the Conference paper by F. Golladay.

2. INPUT-OUTPUT IN LARGE-CITY SCHOOLS

Input and Output in Large-City Schools is a description of an attempt to estimate the technology of education for Chicago and Atlanta, and it compares the results with those obtained for small school

districts in the Project Talent sample. The study was conducted by Jesse Burkhead, Thomas G. Fox, and John W. Holland. It examines the input-output relationships for all of the comprehensive high schools in the two cities and for a sample of small community high schools. The purpose of the study was to illuminate problems of resource allocation within the educational programme, and hence the production function approach was explicitly assumed.

The study performs independent analyses of the data for Chicago and for Atlanta. Vocational-technical high schools and schools for the handicapped were eliminated from the sample, leaving 39 schools with a total enrolment of 85,827 for Chicago, and 22 schools with 18,889 students for Atlanta. The sample of small community schools was drawn from the Project Talent data bank and included 206 public high schools in communities with populations of 2,500 to 24,000. About half of the communities are classified as "small town" or "rural" as opposed to urban. The analyses of Chicago, Atlanta and small communities, are considered as three distinct studies.

Several candidates for the dependent variable were considered. An attempt was made to examine both cognitive and affective development; cognitive skills measured by achievement test scores, post-high school educational plans, and employability. Affective development was indicated by the inverse of either the drop-out rate for the school or the delinquency rate. Burkhead et al. recognised the importance of selecting a measure of school output which in some sense portrays the community goals for education.

In the study of Chicago schools they employed two measures of academic achievement. In the first, they studied the proportion of the students of each school who scored in the upper 60% of all Chicago students in the appropriate norm group on a test of ability prepared by the Educational Testing Service. In the second, they attempted to explain reading achievement scores on the Davis Reading Test. Affective skills were measured by the percentage of voluntary drop-outs indicated by school principals, or by the percentage of students planning to continue full-time education beyond high school as determined by a survey of students.

Ten independent variables were included in the statistical analysis for Chicago. The socio-economic level of the school was measured by the median family income of the school district, which was obtained from visual examination of the United States census tracts included in the school attendance area. The scale of the school was portrayed by the average daily attendance. School inputs were represented by the remaining variables. The quality of the physical plant was measured by the age of the principal structure. Variables were included which indicated per-pupil expenditure for textbooks and for all other current materials and supplies including utilities and maintenance costs. The quality of staff inputs was determined by the average years of experience of a random sample of 20% of teachers in each school and by the proportion of teachers in the sample with at least an M.A. degree. The three remaining variables were the number of man-years of teachers, administrators, and auxiliary staff per pupil. The teacher-student variable is adjusted to remove teacher time devoted to administrative functions; auxiliary staff includes librarians, military instructors, driver-education instructors, guidance counsellors, and paraprofessional aides. All data were gathered for schools rather than for students.

The statistical analysis consisted of calculating simple linear functions of the independent variables. Stepwise linear regression is employed. The variables are entered into the statistical analysis in the following order: 1) socio-economic variables, 2) scale of the school, 3) per-pupil current non-instructional expenditure, 4) staff quality, and 5) per-student man-years of staff. In effect, all joint explanation attributable to socio-economic characteristics of the student body, and all other variables, is assigned to the socio-economic variable.

Socio-economic variables are found to be the most important determinants of all measures of school outputs. Teacher experience is found to be the most important in-school influence. The remaining variables show little systematic relationship to output measures, largely because there is very little between-school variation in these inputs. The size of school is found to have no discernible effect on output.

The study of the Atlanta school system is analogous to the Chicago study, with some modifications in response to data availability. The output measures employed were the scores of 10th grade students on the school and college ability test prepared by the Educational Testing Service, summarised into school median verbal achievement scores, the percentage of male drop-outs from male enrolments, and the percentage of the 1961 graduating class in school in 1961-1962. The latter variable was included rather than student expressions of intention because it was felt to be more accurate.

The independent variables are considerably different. Socio-economic class of the school is measured as it was for Chicago. The remaining variables are: current expenditure per pupil, age of the building in years, annual library expenditure per pupil, average faculty salary including administrative and auxiliary staff, enrolment-faculty ratio, faculty turnover rate and total active registration, and the scale of the school (this last variable was highly correlated with race, negro schools being larger than all-white schools).

The statistical analysis for the Atlanta data is analogous to that for Chicago except that the scale of the schools is entered last rather than second as it was for Chicago.

The conclusions for Atlanta are similar to those for Chicago. Socio-economic characteristics of the student body are found to be more important than school inputs in explaining all dimensions of output. The level of expenditure does not bear a statistically significant relationship to any output. Faculty salary levels, which should be interpreted as a proxy for experience and education, show some relationship to verbal ability but not of a statistically significant level; faculty-student ratios are also shown to have some explanatory power.

The small community data are less comparable to Chicago or Atlanta observations. The output measures available are mean reading scores of 12 grade schools, percentage of male students dropping out of school between the beginning of grade 10 and graduation, principals' estimates of percentage of students that may be expected to attend college, and the growth in reading skills from grade 10 to grade 12.

The independent variables are, again, median family income for students in the school, estimated from census data and a set of input and process variables: building age measured on a 10-point scale, number of books in the library per student enrolled in the 12th grade, average years of teacher experience, average class size in non-scientific subjects, male teachers' starting salaries, per-student total expenditure, and 12th grade enrolment. Average class size is employed as a substitute for student-staff ratios used in other studies; teacher starting salaries replace average faculty salary, which in previous studies represented teacher experience and educational attainment. Enrolment in the 12th grade is a proxy for the size of the school.

The conclusions of the small community schools study are more ambiguous than results for city schools. Community income remains the most important variable; however, starting salary is also found to be important. The age of the school, its size, the number of books in the library and class size, do not exert any systematic influence on school outputs.

This analysis of inputs and outputs for schools is subject to technical criticisms similar to those made with respect to the Coleman Report. The stepwise regression procedure for analysis is subject to most of the same difficulties of inference cited with respect to the Coleman analysis of variance procedures. The lack of theoretical justification for choice of independent variables and their functional relationship to the dependent variables is another weakness shared with the Coleman Report.

The conclusions of the small communities study reflect similar problems to those discussed in connection with Chicago and Atlanta. The ambiguity of the conclusions is consistent with the hypothesis that the socio-economic variables actually measure not only extra-school influences but also quality of inputs. By the same token, the importance of teachers' salaries may really reflect differences in the socio-economic structure of the community which are inadequately measured by the socio-economic

variables. The importance of variables in the small communities study, which appear less important in the large communities study, may reflect the fact that much greater variability in the independent variables is observed between the small communities than within the large-city school systems.

3. A STUDY OF PUPIL ACHIEVEMENT

A Study of Pupil Achievement was prepared for the State of California in order to provide measures of district performance i.. elementary education. More than three-quarters of all 5th grade students were given tests of ability and achievement, and extensive data on the characteristics of student bodies, schools, staffs, and finances were gathered for each district. Charles S. Benson subjected the data to extensive analysis in an effort to identify the sources of between-district differences in student achievement.

The sample chosen for study consisted of 392 school districts in the 17 California counties included in the United States Census Bureau's definition of standard metropolitan areas. These schools enroll 1,850,000 students in average daily attendance. All information was gathered as average values for districts, so the sample size for analysis was 392.

The study employs achievement test scores in reading comprehension and arithmetic reasoning obtained from administration of the California Achievement Tests, 1957 edition, as the dependent variables. Summary scores for the districts were provided as means, median, and interquartile ranges. The tests were in most instances given in autumn 1962.

A large number of independent variables were gathered in the sample. Data were collected for the 33 types of variables below:

1. Intelligence Test Score
2. Grade Span of District
3. Average Daily Attendance in Elementary Schools
4. Adjusted Assessed Valuation
5. Area of District in Square Miles
6. District Taxes
7. State School Fund Apportionments to Districts
8. Total Income of Districts
9. Expenditure on Instruction
10. Total Current Expenditure on Education
11. Total Expenditures
12. Non-salary Instructional Expenditures
13. Number of Full-time Elementary Teachers
14. Number of Provisional Elementary Teachers
15. Number of Teachers in Upper Quartile of State-wide Distribution of Salaries of Elementary Teachers
16. Number of Teachers in the Lowest Salary Quartile
17. Expenditure on Teachers' Salaries
18. Number of Non-teaching Certified Personnel
19. Expenditure on Salaries of Non-teaching Certified Personnel
20. Number of Principals
21. Expenditures on Principals' Salaries
22. Median Family Income
23. Median School Years Completed by Adult Population
24. Male Civilian Labour Force
25. Number of Male Professionals, Technicians, Managers, Proprietors
26. Number of Unemployed Males

27. Number of Persons Under 18 Years Old
28. Number of Persons Under 18 Living with both Parents
29. Number of Housing Units
30. Number of Owner-Occupied Housing Units
31. Number of Renter-Occupied Housing Units
32. Median Value of Owner-Occupied Housing
33. Median Contract Rent of Renter-Occupied Housing

No variables are included in the data which would measure the internal allocation of resources within education. In particular, none of the variables captures the diversity of school facilities, curricula, or instructional methods.

The data were obtained from the financial reports of the State Department of Education, 1960 Census of Population, and tests administered on behalf of the project. Where appropriate, the data were converted to per-student, per-teacher, or proportions units.

Several types of analyses were employed in studying the data. First a correlation matrix was computed; ability measures and achievement were found to be highly correlated, indicating that ability tests are not statistically distinct from achievement examinations. The socio-economic variables were also discovered to be highly intercorrelated; socio-economic variables and achievement are also correlated. District wealth factors were shown to be little correlated with any of the achievement measures; the correlation coefficients ranged from .009 to .136 with the greatest being for the 1957 tax rate, which might be readily interpreted as an index of community characteristics since tax rates are, in part, locally determined. Study of district income sources and achievement reveals that state aid to local districts is negatively associated with achievement, which merely indicates that assistance is given to the most needy schools. Achievement and staffing patterns are second most closely associated after achievement and the socio-economic variables. The quality of teachers measured by salary and quality of credentials appears important; however, the class size variable is not highly correlated with student achievement.

In the second stage of the analysis, the sample is stratified on the basis of achievement, ability, or socio-economic class. Stratification by achievement reveals that school characteristics are more important to high and low achievers than to average students. In particular, variables describing the level of expenditure and quality of staff appear more closely related to achievement than in the unstratified study. Partitioning the sample by student ability reveals that low ability students are more responsive to the level and quality of inputs than either middle or high ability groups. The grouping of districts by socio-economic characteristics tends to increase the relationship between achievement and class size, and the level of teachers' salaries as opposed to administrators' salaries for the highest group. In the remaining socio-economic groups, the results were ambiguous and difficult to interpret.

In a third stage of the analysis, coefficients of incremental determination and significance tests are calculated for an eight-variable model. Median district reading achievement scores are employed as the dependent variable; median adult educational attainment, median household income, per cent of teachers in the lower salary quartile, per cent of teachers in the upper salary quartile, teachers per pupil, mean administrators' salary, and per-pupil instruction expenditure are used as independent variables. Median education of adults explains 38.2% of the variation in achievement, the seven variables together explain 56.0% of variation.

Benson concludes from his study of California school districts that the home environment of students is strongly related to both ability and achievement measures, that the quality of teachers is the most important in-school factor, and that, for some types of students, class size and staffing patterns are also important.

As in the previous two studies discussed, the analysis is weakened by the lack of theoretical framework. Furthermore, it is not clear to what extent the aggregation of variables up to district averages biases the estimates, though there is no clear a priori reason for believing that it does so.